>> Welcome to the podcast series of Raising the Bar Sydney. Raising the Bar in 2019 saw 21 University of Sydney academics take their research out of the lecture theatre and into bars across Sydney, all on one night. In this podcast, you'll hear Catherine Grueber's talk Animal Conservation: Are We Doing it Right? Enjoy the talk.

[Applause]

>> Thank you, Dedra. And thank you to everybody for coming tonight. I'm really excited to tell you about some of the challenges and victories that we've been facing in animal conservation. And I'm also looking forward to hearing some of your thoughts during the question session as we think about some of the difficult decisions that conservation biologists face. Saving endangered species is hard. Lots of different animals are facing all kinds of challenges in this modern world. For some, their habitat is being changed for human activities. For other species, they have to compete with introduced animals that are not native to their land, but other species that might eat them or eat their babies or eat their food. For other species, they may be suffering from diseases. But it is so important that we do try. Take a Tasmanian devil for example, and I'll be talking a little bit about devil today. They are the largest marsupial carnivore and they are very special. They are about the size of a small dog and they are feisty beasts. They can eat almost anything. In fact, they have the strongest jaw bite force for their size of any animal. But more than just being an iconic and fascinating species, devils are really important in the ecosystem. Because they're carnivores, they will eat the carcasses of other animals that have died and therefore help prevent the spread of diseases. They're also important in the ecosystem because of their size and because they're carnivores. It's thought that they can help keep the numbers of other introduced animals such as cats and foxes down to low levels. And that's really important because foxes and cats, if they got to high numbers in the Tasmanian ecosystem, that could be devastating for a whole variety of very special endangered animals. Now there are lots of different methods that conservation biologists will use to try and save endangered species. For some, it might be about trying to rebuild the habitat that the animals live in. For other people it might be about thinking about creative ways that humans and animals can coexist. Or for others it might be about trying to remove some of the threats, maybe cure the diseases or remove some of those nonnative species such as rats or so on. But for me, I'm interested in trying to figure out how we can use other populations of animals to try and save endangered species. How we can establish new, safe protected populations such as offshore islands or maybe in a wildlife park or a protected area or in zoos. The ultimate goal of conservation is of course to have wild animals in the wild but for over 2,000 species around the world, the use of zoo-based or wildlife park-based breeding programmes is essential for preventing extinction. So that's a lot of species that are relying on these kinds of breeding programmes in order to survive. So we need to be really sure that we're doing it right and that the methods we use are going to be effective for helping to save those species. So let's look at Tasmanian devil. Since 1996, devils have

been faced by a various disease called devil facial tumour disease. 1996 is not so long ago, but in that time the population has declined by almost 80%. As I said before, Tasmanian devils are really important in the ecosystem, so a massive decline in a species like that can have really important consequences for lots of other animals and even plants in the ecosystem. So the Tasmanian state government and the Australian federal government got together and they joined forces with the Australian zoo industry and thought about what they needed to do. And in 2006, there was an insurance population established to help protect devils. The insurance population has been very successful, and today it numbers around 700 devils in 37 institutions. Now the Tasmanian devil insurance population was established with a variety of goals in mind. And one of the most important of which was to have a healthy population of devils. So this is a breeding programme for animals that don't have the disease. And the project was always designed so that those breeding animals or their offspring could be released back into Tasmania at the time that it was decided it was appropriate to do so. So in the meantime, Tasmanian devils in the wild have still been declining. And the population has become quite fragmented. So what we mean is there's little pockets of devils that are existing in certain places, but those pockets are small and isolated from one another. When a population gets really small, you can imagine that causes all sorts of problems for the genetic diversity. It can lead to an increased risk of extinction as well because small populations are really vulnerable to little changes that might happen. So it was decided by the Save the Tasmanian Devil programme that it's time now to start introducing animals back into the wild from the breeding programme to prevent those negative effects. But here's where the story gets a little bit tricky. It was quite a sad thing, actually. Because when the devils were released back into the wild, back into their home, a really distressing thing happened. Quite a lot of the devils that were released were hit by cars on the road. And unfortunately many of them died. As you can imagine, if you're a conservation biologist who's trying to save an endangered species doing everything you can, putting all of your efforts into that, and then you see individuals being hit by cars, that can be really distressing. And in fact, because ever devil is precious, losing any can be devastating for the programme. So I should take this moment to point out that being hit by a car is actually the second biggest threat to carnivores such as Tasmanian devil after devil facial tumour disease. They're carnivores so they'll eat anything. And if there is another animal that's been hit by a car and its body is still on the road, the devil will see that as a free meal. Of course it's nighttime, devils are mostly black. They're busy munching and they don't see another car coming around the corner. The drive doesn't see them either and that's what happens. So it's just a good reminder I suppose for everybody that when you're driving at dusk and dawn, to be really mindful that there could be animals on the road and they're busy not paying attention to you, so you need to be paying attention and looking for them. But back to the devil conservation story. Because some of the devils were hit by cars and because this was such a concern for the Save the Tasmanian Devil programme, they got in touch with us. They wanted to see if there was anything that could be done. So we had

a look at the data. We compared the characteristics of those devils that had been hit by cars with the ones that weren't hit by cars. We wanted to see if there was anything that was different about those animals that might put them at great risk, so we could use that information in the future. We looked at all kinds of things. We looked to see if there was any difference between males and females. There wasn't. It didn't matter. They were at the same risk. We looked to see if there was any difference in the ages of the animals. That didn't matter either. We looked to see if there was any effect of where in particular the animals had come from. And that didn't seem to matter either. What we did find though was that there was an effect of the length of the family heritage that that animal had had in the breeding programme. The longer they had been in the breeding programme, the more likely they were to get hit by a car. This was a really tricky conundrum for us. Because we need the devil breeding programme. We need to be breeding healthy devils. They need to have a place where they can raise healthy babies so that they can support the species. But it was causing problems when they got released to the wild. Fortunately, by working with the Save the Tasmanian Devil programme and by looking at the data, the solution was also there too in the data. Devils that had been released from one of the facilities, Maria Island, those animals that were released to the wild, they didn't get hit by cars. And so now what happens is animals that are raised in the zoo breeding programme get released onto Maria Island. Maria Island is a little bit more wild-like. It's like a stepping stone. There are no cars on Maria Island, so the devils are not at risk of being hit by cars. But they get used to living in that wild environment and they can contribute to the genetic diversity of the population. They can still live out their devil lives. And then those animals are released to the mainland of Tasmania and contribute to the population there. By examining the data and looking at what we could do differently when we had an experience that didn't turn out quite how we liked, we can think of new ways to make things better. The solution to this problem has improved the welfare of devils because they're not being hit by cars anymore. And it's improved the programme as well because it's helping to boost the survival of those very small population. I hope what this particular story shows you is the commitment of zoos, government organisations and university researchers to work together to find solutions that maximise the positive outcomes when things go wrong. Sometimes it's not always easy to predict what will happen when we try something new, but through quick action of all parties involved, we can strive to make it better. Together, we call this process adaptive management. It's when conservationists try new bold actions to make a big difference and then they monitor very closely what happens so that they can quickly adapt if things are not turning out how they expect. So let me give you another example. You might have noticed from my accent that I'm originally a New Zealander. My next example is from a New Zealand bird. You might not have heard of this bird. It's called a takahe. So takahe are a large bird. They're about the size of a turkey. They have green and blue iridescent feathers. They are flightless and they spend their whole life on the ground, but they live way up in the mountains. They feed on grasses, insects,

worms, all that kind of thing. And they have their babies under these big grassy tussock bushes. The tussock bushes, they're on the ground and they put their nest underneath there. And because it's quite high up in the mountains, often it snows and so you get this big snow drift over the tussock. You can imagine that for the cute little fluffy babies it's like a little warm, cosy snow cave for them. So it's perfect if you're a takahe. Or at least it was, until introduced mammals came to New Zealand. New Zealand has problems with introduced rates, same as here in Australia. And also this problem of stoats. Stoats are like a weasel. You don't have them here in Australia, but they love to eat endangered New Zealand animals, so they are a problem over there.

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>> So stoats are one of the reasons why takahe has declined. They would get into the nest and eat the babies and the unfortunately the population couldn't sustain itself. And in fact, the population of takahe was thought to be extinct for a really long time until 1948 when a local doctor who was on a mission believed that they could still be there, still hanging on, and led a couple of expeditions into the mountains and actually found them, amazingly. So since they were found, it was realised by the New Zealand Department of Conservation that the situation for the species was pretty precarious. As a result, some birds were moved onto offshore islands, and these are island reserves around New Zealand that don't have rats or stoats. So the birds could live out their takahe lives on these islands and they wouldn't have their babies eaten by stoats. So it's a little bit like the devil example. The idea was that this could be a breeding population that would help support the species. Hopefully if enough birds were breeding really well, then some of those offspring or the birds themselves could be translocated back to their home in the wild. Now takahe are very territorial. Even though the islands were reasonably large, they take up a lot of space. And so takahe – you can't fit too many of them on an island, otherwise they'll fight or they won't breed properly. And you might remember that I said takahe are flightless. So the Department of Conservation had to establish a bunch of islands, but the birds couldn't move between them. Not by themselves, anyway. They couldn't fly. So again we have this problem of small populations living on these islands. Over time, you can probably already see where I'm going with this. They're going to start running out of options for their breeding partners, let's say. Over time they may start potentially breeding with their cousins or so on. It's an unfortunate thing that just happens with – I can see some people already uncomfortable with this conversation.

[Laughter]

But it's an unfortunate thing that happens with endangered species. They just don't have many choices. So what can be done about that? Well, as conservation biologists, we were the ones who put them on the island. So we can look for a solution. And one solution would be to go onto the island and take some of the birds and move them onto another island with other birds that they're not related to, other birds that they don't know, and give them more opportunities

and more options. That would certainly help, and problem solved, right? So you might be thinking, "Yeah, okay, that's easy. Why don't we just do that for these birds?" But I wanted to point out that moving animals around is not trivial. If you imagine for a moment that you're a takahe, a little ground-dwelling flightless bird living on an island eating grass and happily minding your own business, when a bunch of conservation biologists suddenly rush out of the bushes. For takahe, they actually have to catch the birds. They won't go into traps like mammals will. So you have to rush out of bushes and then net the bird and put it in a crate, small crate. Then carry that crate or perhaps put it on a quad bike and take it down to the edge of the island where you might put it on a boat or a plane. Take it across to the mainland, then in a truck to the vet, make sure it hasn't got any weird diseases. Then back on another truck, back on a boat or a plane, released onto a new island, a completely new island. An island you've never been to before. You don't know any of the birds on that island. You don't know where the food is. It's pretty stressful. You've just been through this big adventure and then you don't know where you are. But that's what we do when we translocate animals, and we hope for the best. We hope that they'll find homes, that they'll find foods. And best-case scenario, we'll hope that they fall in love and make more takahe babies, because that's what it's all about. It's a big deal. And so if we're going to do it, we want to do it for the right reasons. Not only is it stressful for the birds, but it costs a lot of money. There's a lot of people involved in that process. So one of the first questions that we faced when the Department of Conservation came to us and asked us what to do about this problem, one of the questions we faced was, okay, we could do that. We could move the birds around and try to, you know, give them new breeding opportunities. But how necessary is it? Are the birds on the islands actually running out of options? Are they really ending up breeding with their relatives? There's a difference between breeding with say a cousin versus breeding with a fourth cousin twice removed, you know. It's not quite the same. Is that what's happening? And then even if they do breed with the relatives, is that as bad as if we put them in a crate and shipped them across the country? Is it worse? Is it just as bad? We didn't know. And the Department of Conservation didn't know either. You can see that this is a really tricky problem, and a lot of problems in conservation biology are like this. Those are our options. Either we leave them alone and possibly they breed with all their relatives and they have maybe birth defects or they don't live very long or who knows. Or we stress them out and put them in crates and maybe they don't survive the journey, perhaps, if it's too difficult for them. They're both difficult choices. But the only way that we can really make these decisions is to look at the data. And that's what we did. For one of the studies that I was involved in, we went and observed the birds. We looked at them to see, are they breeding with relatives? And if so, how often does that happen? Is it reasonably common, or is it quite rare? And when it happens, is it serious? Is it harmful for those birds? At the same time, conservation biologists were looking at the translocation data. When they initially put the birds on the island, what happened? They had to go through that whole process to save

them from the stoats. They put them on the island and so they had a look to see, well, how did they do? Some of the birds didn't breed in their first year. I guess the adventure was quite adventurous for them. But takahe live for 20 years or more. And many of those birds would breed in their second year. They got used to their new place. They found their way and then they would breed for several years after that. So on balance, when we started to pull the data together, the picture started to emerge. The data on the breeding showed us that actually yes, the populations were very small. And the chance of breeding with relatives was very high. And what's more, we saw that in a few cases where it had happened, the outcomes were not good. The fertility of those breeding pairs was reduced. And in conservation breeding programme, reduced fertility is a serious problem. We'd be very concerned about that. So when we got together with the conservationists, we looked at all the data together. We looked at the different kinds of studies, all the options. We put them out on the table. How many birds would we need to move in order to prevent those negative outcomes? How many would need to – yeah. So how many would we need to move? And how many birds would be affected by that? In the end, the decision was made that because the translocation was reasonably okay for the birds, but because not doing the translocation was even worse, we decided that we would move the birds. And now that's what's happening. The birds are being translocated between the islands to give them new options so that they can breed with one another and they've got more opportunities to make lots of little cute, fluffy takahe babies that don't get eaten by stoats. At the same time, there are other conservationists who are looking at the problem back in the wild. They're looking to see if they can remove some of the predators from there and the birds can go back to the wild, back to their home. I hope what I've been able to show you today is that in conservation biology, we face a lot of really difficult challenges. And oftentimes it's very easy to sit back and say, "Well, I just don't know what to do." And then by default to end up saying, "Let's not do anything." But not doing anything is also a choice. And like in the takahe example, if we had just left the birds alone, they would have continued breeding with their relatives and the population would have gone down. But then some of the options that we have are not great either. And that's really hard too. Maybe we need to translocate animals. Maybe we need to move them around, put them in a crate, take them to a stressful place. Maybe like with the Tasmanian devil we need to establish a zoo-based breeding programme. That might be stressful for some of the animals too. But at the same time, otherwise all the devils were getting devil facial tumour disease. Or maybe we need to translocate birds or animals back to the wild and maybe they might get hit by a car. All the options are difficulty, and we don't know what's going to happen. But when we work together with the zoo industry, with conservation biologists at government departments, with other conservation organisations and doing the research, we can start to find some of the solutions. It's not about looking at all those options and saying, "That's not going to work and that's not going to work." It's about looking at them and saying, "Well, here's what we could do. What do the data tell us is going to be the best outcome?" So when you

leave today, I hope that what you will take away is that the next time you see an endangered species story on the news or perhaps you're watching a nature documentary or you're visiting the zoo, have a look at those animals that are endangered and think to yourself, conservation is pretty hard, but there's lots of people doing lots of different kinds of things. Some of those options have good outcomes, and some of them don't have the outcomes we would hope. But it's about choosing the ones that are going to give us the best chance that are the most important. And if you have a think about what your options might be, maybe you might be the one that comes up with some new idea that will just make a big difference for the endangered species that you care about too. And that's it.

[Applause]

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